ATTACHMENT 2

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Economic Assessment of the 1999 X-Factor Model Proposed by the FCC Staff

By

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EXECUTIVE SUMMARY

Changes should be made to the Commission's 1997 model only when clear and unambiguous errors have been detected. As the staff acknowledges in the current FNPRM in a section discussing incentive regulation: "The simple fact that the **X-factor is fixed** and independent of the actual costs incurred creates an incentive for the firm to be efficient." (p. 42, FNPRM, Nov. 15, 1999; emphasis added) In short, properly designed incentive regulation not only rejects a cost-plus paradigm but also requires that, once established, the "rules of the game" not be changed. Ex post "adjustments" designed to reduce earnings run the risk of diminishing incentives and therefore the efficiency payoffs to be shared between firms and consumers.

Having adopted a formal structure for the X-Factor in its May 1997 order, the Commission now finds its staff proposing a totally restructured model. It is presented as the "1999 Staff TFP Study" in the FNPRM released November 15, 1999. There is hardly a variable left unaffected. Revenue, output, total labor expense, compensation per employee, the rental price of capital, capital expense, material expense, operating expense, taxes, and even the BLS input price series for the U.S. nonfarm sector are changed. Interestingly, the incremental effect of each and every proposed "adjustment" leads to an increase in the X-Factor otherwise found in the Commission's 1997 model.

This report examines each of the proposed methodological changes. Since the Commission has transitioned itself away from accounting-based rate-of-return regulation to incentive regulation based on economic concepts and accounts, economic principles become the appropriate yardstick by which to evaluate each staff proposed "adjustment." Economic analysis indicates that, in theory and/or form of implementation, the staff's substantively important recommendations violate both basic economic principles and well-accepted productivity accounting rules. Staff errors, to list only a few, include

- the inappropriate selection of the Baa rate as the measure of LEC opportunity costs,
- a procedure for adjusting the LECs' cost of capital that violates both elementary economic principles as well as the productivity accounting rules found in the very source document cited as authority by the staff,
- the ad hoc disallowance of labor severance payments while the economic model underlying the X-Factor requires their inclusion in labor expense,
- the substitution of local DEMs for calls without any analysis of how output variables must be measured in an X-Factor/price-cap framework,
- adoption of 1998 LEC data that are inconsistent with the staff's own 1985-97 series,
- the inexplicable introduction of an input-price differential based on U.S. nonfarm input prices that do not exist in the cited BLS accounts, and
- failure to symmetrically convert both LEC and BLS nonfarm productivity accounts to consistently defined external rate-of-return bases.

This said, if clear and unambiguous errors are found in the May 1997 model, modifications should be made. The analysis developed in this report suggests that two of the conceptual changes proposed in the FNPRM should receive serious consideration. One tends to raise X, the other to lower it. First, the staff proposes that the measure of local output be changed from calls to local DEMs to account for the effects of increased Internet use. In principle, Internet use is certainly an exogenous event that may require modifying the measure of local output. However, DEMs is not the appropriate metric. Since X is used to cap prices, each output variable in the X-Factor calculation must be defined as closely as possible to the unit measure on which market price and revenue are based. Driving 80% of local revenues, access lines become the appropriate candidate to replace calls. Access lines are adopted in this report and, other things equal, lead to a higher X-Factor. Second, the staff now recommends that the internal rate of return in its 1997 model be replaced with an external rate of return. This recommendation is consistent with economic principles and, in making it, the staff now embraces a position recommended long ago by USTA. The staff's implementation procedure, however, violates both economic principles and long-established productivity accounting rules. The external rate of return must be (i) an economically meaningful proxy for the LECs' opportunity costs and (ii) implemented so as to adjust only that portion of capital expense corresponding to

LEC opportunity costs. The staff's recommended adjustment to the LECs' cost of capital violates both precepts. Proper adjustments are made in this report and, other things equal, are found to lead to a lower X.

Both the FCC's 1997 model as well as a properly designed 1999 staff model lead to the same policy conclusion: the present 6.5% X-Factor is not justified by any meaningful measure of LEC performance.

	1997 Staff Model	1999 Staff Model	
		Corrected	Uncorrected
1991-98	4.12	3.29	6.33
1994-98	4.06	3.76	6.02

INTRODUCTION

The current X-Factor is set at 6.5%, a rate determined in 1997 primarily on the basis of what the Commission then believed was a rising three-year trend in the 1993-95 period. The U.S. Court of Appeals for the District of Columbia Circuit rejected, among other things, the appropriateness of interpreting a three-year movement as a trend rather than a cycle. Subsequent updates of the Commission's model indicate conclusively that the Court's common sense skepticism was well founded. X-Factors for 1996, 1997, and 1998 were found to be 1.98, 3.62, and 3.03, respectively—factors that not only are well below the 6.5% policy standard but also clearly refute the "trend."

The Commission staff now proposes a totally restructured X-Factor model. It is presented as the "1999 staff TFP Study" in the FNPRM released November 15, 1999. There is hardly a variable left unaffected. Revenue, output, total labor expense, compensation per employee, the rental price of capital, capital expense, material expense, operating expense, taxes, and even the BLS input price series for the U.S. nonfarm sector are changed. The staff argues that each change is required to address "errors" in the 1997 model adopted by the Commission. Interestingly, the incremental effect of each and every proposed "adjustment" leads to an increase in the X-Factor otherwise found in the Commission's 1997 model.

This report examines each of the proposed methodological changes. Economic principles become the appropriate arbiter and suggest that, with two exceptions, the 1999 staff model errs against both economic theory and productivity accounting rules. The two exceptions are the staff's call for adoption of an external rate of return and a new measure for local output. A simulation of the 1999 staff model is developed which properly implements these recommendations while correcting for other modeling and data errors. The 1991-98 and 1994-98 average X-Factors in the Commission's 1997 model were 4.12 and 4.06, respectively. The corresponding averages in the corrected 1999 staff model are 3.29 and 3.76, respectively.

1. OPPORTUNITY COST OF CAPITAL

The most significant difference between the 1997 and 1999 staff models involves the treatment of the cost of capital. The 1997 model begins from the premise that total revenue equals total cost. Consistent with this framework, property income (total expense associated with capital input) is calculated as a residual formed as the difference between total revenue and the sum of labor and material expenses. Actual earnings are assumed to reflect LEC opportunity costs and therefore are considered part of the required return to capital. In contrast, the 1999 staff model is premised on the belief that total revenue does not equal total cost. As a result, property income is not defined as a residual as in the 1997 staff model but is formed from an independent calculation based on an external rate of return.

The 1999 staff model adopts the following position. If profits are above LEC opportunity costs, the total required dollar return to capital and the resulting rental price of capital would be upward biased in the 1997 model. Symmetrically, if the LECs earned less than their true opportunity costs, required property income and the derived rental price would be downward biased via the 1997 residual method. The 1999 staff model proposes calculating the rental price directly and multiplying it by capital input to derive a stand-alone measure of property income. In short, the 1997 model adopts an "internal rate of return" framework in defining property income while the 1999 model embraces an "external rate of return" model to define property income.

There are strong a priori arguments in the economics literature supporting the use of either internal or external rates of return. AT&T and its expert Dr. John Norsworthy argued that the Commission should adopt an internal rate of return. USTA recommended the use of an external rate of return. In fact, USTA's own TFPRP model still uses an external rate of return. Book-length reports could be written on the relative merits of each approach in alternative applications and each could draw support from economic theory.

However, once the decision is made to adopt an external rate-of-return framework, economic theory is uncompromising regarding how external rates of return are to be calculated and applied. The critical present task then is to determine (a) whether the staff correctly applies sound accounting and economic principles in calculating a proper external rate of return appropriate to the LECs and (b) whether that rate has been correctly incorporated into the 1999 staff model. There are a number of important distinct issues underlying these two main themes. They are addressed in the following subsections.

1.a. Moody's Baa Rate is Not the Appropriate Measure of LEC Opportunity Costs.

The 1999 staff model takes the quite defensible position that LEC opportunity costs should be measured by an external rate of return but then immediately embraces Moody's Baa bond rate as the appropriate metric. No justification is offered explaining why time series movements in the Baa rate are the appropriate proxy for changes in LEC opportunity costs. At most, the author states that changes in the Baa rate are highly correlated with changes in other financial instruments. (Fn. 35, p. 47, FNPRM, Nov. 15, 1999) Economic principles, however, require far more than that.

Opportunity costs are defined as the return an investor can expect in the next best use of its funds. While this definition applies to all "investors," the appropriate empirical proxy for opportunity costs varies across investors. An eighty-year old individual with sparse funds would be well advised to look to very safe government securities as an appropriate yardstick for his opportunity costs. A young, highly educated and motivated woman in the early phase of her earnings cycle in a lucrative job should define the opportunity costs of her employment not with reference to any bond rate but with respect to her potential earnings with some other employer. Similarly, if the LECs (or their investors) "cashed

out" and exited the telecommunications industry, would their rational next-best use of investment funds be a Baa bond? Prudent advisors would more likely suggest investing available funds in some alternative industrial activity. The LECs and their investors would not be passive bondholders, but proactive owners of some industrial (product or service) enterprise.

For purposes of illustration, I propose that the rate of return series reported by Value Line for its sample of 875 large industrials better represents expected movements in LEC opportunity costs than does the Baa or any other bond rate. The Value Line time series, appropriately incorporating both debt and equity returns to capital, is reported in column 2 of Table 1.[1] Moody's Baa rate is reproduced in column 1. (Table B-8, p. 60, Appendix B, FNPRM, Nov. 15, 1999)

The disparate trends after 1991 are of considerable importance. While the economy has been enjoying record-setting growth since 1991, inflation and interest rates have been under control. As a result, bond rates have trended downward while earnings have increased. For investors in large corporations like the LECs, which series better reflects opportunity costs of investment funds? The answer is obvious.

It is important to emphasize that one cannot rebut the use of the Value Line series by arguing that the 875 industrials may include some firms that are not members of perfectly competitive industries. The definition of opportunity costs imposes no conditions on the source of funds but simply inquires as to their "next-best use." For those who invest in companies like the LECs, their investment alternatives are better represented by returns in like-sized firms than by the return on bonds. The investment options available to the LECs are a function of the magnitude of funds available to the LECs, rather than being predetermined by bond options available to individual households.

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[1] Value Line, Value Line Selection & Opinion, (July 23, 1999), pp. 5445-46.

Table 1

LEC Opportunity Costs of Capital

Year	Moody's Baa Rate	Value Line 875 Industrial Rate of Return
1987	10.6 %	11.0 %
1988	10.8	12.5
1989	10.8	11.7
1990	10.4	10.5
1991	9.8	8.5
1992	9.0	9.6
1993	7.9	10.9
1994	8.6	11.9
1995	8.2	12.9
1996	8.1	12.7
1997	7.9	13.2
1998	7.2	11.9

1.b. The 1999 Staff Model Applies Its Baa Adjustment to the Entire Rental Price of Capital but Opportunity Cost Is Only One Component of the Rental Price.

Appendix B to the Commission's FNPRM provides the basis for the staff's proposed change to its treatment of the cost of capital.

> Conceptually, the difference (residual) between revenue and the required returns to all non-capital inputs...consists of two parts. The first part is the required return to capital. The second part is the excess profit earned by the firm. Instead of attempting to separate this difference into two parts, however, the Commission in the *1997 Price Cap Review Order* simply assumed that all of this residual was the required return to capital, *i.e.*, that no excess profit was earned....
>
> In order to correct the miscalculation of the LECs' cost of capital in the 1997 Staff TFP study, it is necessary to replace the TFP study's cost of capital with a competitive cost for the inputs during the historical years. (pp. 45-6, FNPRM, Nov. 15, 1999)

To implement this strategy, the staff takes the unit cost of capital for 1991 as calculated in the original 1997 staff study and moves it forward and backward in time by applying the full basis point changes observed in Baa rates over those years. The author's assumption, now made explicit, is that the entire cost of capital ("rental price of capital" in the FCC's 1997 model) should move in sync with movements in opportunity costs. It is here that the author commits a serious violation of both accounting and economic principles, quite apart from its selection of the Baa rate.

The above quotation from Appendix B states that payments to capital input ("property income" in the language of the staff's 1997 model) "consists of two parts." In truth, it consists of far more than two parts. Payments to capital input, in both 1997 and 1999 models, must include some measure of opportunity costs but must also include compensation to capital input for depreciation, amortization, rental payments, business transfers, capital gains and losses on assets, property taxes, and federal, state, and local income taxes. Opportunity costs are only one component of the "required return to capital input."

Even if one believed that opportunity costs in the 1997 staff model are mismeasured and even if one believed that LEC opportunity costs are best proxied by the Baa rate, any adjustment must be applied only to that portion of property income (and therefore only to that portion of capital's rental price) that corresponds to opportunity cost. There is certainly no basis for believing that time series movements in Baa rates are meaningful measures of movements in depreciation rates, amortization rates, property or income tax rates, etc. This, however, is precisely what the 1999 staff model does when applying 100 percent of all basis point changes in the Baa rate to the LECs' rental price of capital. This violates the most fundamental accounting and economic principles.

The staff's position is especially surprising given its own citation to the pioneering work of Jorgenson and Griliches at footnote 32 in Appendix B to the FNPRM. The cited paper has become one of the benchmark references for TFP measurement. At pages 267-68 of that paper and in more detail in its statistical appendix at pages 276-78, Jorgenson and Griliches make clear that the rental price of capital incorporates far more than opportunity cost. The list provided above corresponds to the standard components of property income found both in the U.S. National Accounts and in all credible models of productivity measurement.[2]

This discussion begs the question as to how much of capital's rental price (and therefore its movement over time) is subject to adjustment by any decision to replace the internal rate of return with any external rate-of-return measure. As an illustration, I deduct (i) depreciation and amortization expense as reported in the Commission's 1997 model and (ii) LEC income taxes reported in Accounts 7220 and 7230 from total property income. The results of that investigation are reported in Table 2.[3] Depreciation, amortization, and

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[2] Jorgenson, Dale, Frank Gollop, and Barbara Fraumeni. Productivity and U.S. Economic Growth. Cambridge, MA: Harvard University Press, 1987), pp. 109-48, esp. p. 124.

[3] No calculation needs to be made for years prior to 1991. Under rate-of-return regulation, the LECs allowed rates of returns in those years presumably reflected opportunity costs as defined collectively by state and federal commissions. This issue is discussed in detail in section 1.c.

Table 2

Earnings Share in Property Income
(Dollars in Thousands)

Year	Property Income W/Depreciation (Chart D9, Col G) (A)	Depreciation & Amortization (Chart D8, Col C) (B)	Federal & State Income Tax (Accts 7220 & 7230) (C)
1991	$ 24,641,357	$ 13,499,778	$ 2,965,866
1992	26,477,135	13,822,882	3,078,975
1993	26,914,823	14,244,514	3,619,526
1994	26,366,385	15,068,058	2,862,758
1995	27,166,096	15,556,284	3,865,155
1996	30,414,808	16,377,242	4,854,531
1997	30,679,731	16,758,832	4,612,796
1998	33,340,502	17,306,863	6,696,650

Year	Earnings + Misc. Capital Expenses (A – B – C) (D)	Max. Earnings Share in Property Income (D / A) (E)
1991	$ 8,175,713	33.2%
1992	9,575,278	36.2
1993	9,050,783	33.6
1994	8,435,569	32.0
1995	7,744,657	28.5
1996	9,183,035	30.2
1997	9,308,103	30.3
1998	9,336,989	28.0

income taxes alone account for approximately 70% of property income. Earnings (including interest payments) and miscellaneous capital expenses including property taxes, rent paid, and business transfers together account for the remaining 30%.

The simulation developed later in this report applies an external rate-of-return adjustment to 30% of property income to illustrate the importance of properly applying an external rate of return metric. However, it is important to emphasize that any formal adoption of the staff's proposal will require a far more detailed analysis of LEC capital accounts than provided in Table 2. Further decomposition of these accounts would certainly find that any earnings adjustment should apply to much less than 30% of property income.

The important conclusion is that the staff's application of full basis point changes in the Baa or any other bond index to the LEC rental price is wholly unjustified. In fact, it is fair to say that the staff's proposed adjustment method may introduce far more bias than does the 1997 staff assumption that actual returns proxy opportunity costs. Without question, implementing any meaningful "adjustment" will require considerable data effort, well beyond the requirements of the staff's 1997 model, and that is even before considering what independent metric should be used to measure an external rate of return appropriate to the LECs. Given the "simplicity" standard adopted long ago by the Commission in its X-Factor proceedings, perhaps this is one reason it opted for an internal rate of return model.

An amended version of the staff model is developed later in this report. It adopts the procedures proposed by the 1999 staff model to adjust the rental price of capital to reflect an external opportunity cost standard. The only two differences are that the adjustment is applied only to that portion of property income that corresponds (conservatively) to LEC earnings and is based on the rate of return experienced by the Value Line industrials.

1.c. Its Own Model Should Have Warned the Staff that Its Application of the Baa Rate Was Inappropriate.

The 1999 staff model adopts the assumption that LEC returns in 1991 equaled the companies' true opportunity costs.

> The base year is 1991. This is the first full year of LEC price cap. The implicit assumption is that the cost of capital for this year was at a competitive level. That is, it is assumed that LECs earned a normal return in that year. (Footnote 36, p. 47, Appendix B, FNPRM, Nov. 15, 1999)

The staff then adjusts that 1991 cost of capital forward and backward in time using the Baa rate as described above.

The forward adjustments are consistent with the staff's concern about possible differences between internal rates of return and LEC opportunity costs, but the backward adjustments are totally perplexing. Why would the staff ever consider adjusting LEC rental prices for years 1985-90 when the LECs were under rate-of-return regulation? If the staff believes that state and federal regulators appropriately set LEC rates in 1991 to reflect true opportunity costs, what was it about regulatory behavior between 1985 and 1990 that made regulators fail to meet their responsibility in each and every year? The author of Appendix B offers no justification for the asymmetric treatment of the rental price of capital in 1985-90, on the one hand, and 1991, on the other hand. Without comment, he "adjusts" the reported rental price of capital in years 1985-90 though these arguably were years in which regulators set rates that generated no excess profits.

If the staff author does not want us to interpret his methodology as an indictment of regulators during the rate-of-return era, then he leaves us with no choice but to indict his methodology. Table 3 presents the rental prices of capital produced under the 1997 and 1999 staff models. The former, reported in column 1, are based on the internal rate of return methodology and are taken directly from USTA's 1999 update of the Commission's

Table 3

Rental Price of Capital

Year	1997 Staff Model (Column H, Chart D9)	1999 Staff Model (Column 2, Table B-8)
1985	23 %	22 %
1986	24	19
1987	24	20
1988	23	20
1989	21	19
1990	20	19
1991	19	19
1992	20	18
1993	20	17
1994	19	18
1995	19	18
1996	21	17
1997	20	17
1998	21	16

1997 model.[4] (This update was filed September 10, 1999.) The latter adopts the Baa adjusted rental prices taken from Table B-8 of Appendix B to the November 1999 FNPRM. If the staff believes rate-of-return regulators fulfilled their responsibilities prior to 1991, how do they explain the differences in the two series over the 1985-90 period? Did rate of return regulators overestimate LEC opportunity costs of capital by nearly five full percentage points in both 1986 and 1987 or is the staff's Baa adjustment process flawed? In any case, the substantial disagreement between the opportunity cost judgment of regulators in 1985-90 and the 1999 staff model proxies for the same period should have at least raised a red flag for those who designed the 1999 staff model. Curiously, no comment is found in the text of Appendix B.

1.d. The 1999 Staff Model Errs By Modifying LEC Revenues, Taxes, and Operating Expenses When Converting to an External Rate of Return Framework.

The authors of the 1999 staff model believe that their adjustments to property income and the rental price of capital require corresponding adjustments to LEC revenues, taxes, and operating expenses. "Recalculating the LECs' historical cost of capital changes the level of the LECs' revenues, taxes, and operating expenses for the historical years." (p. 47, Appendix B, FNPRM, Nov. 15, 1999) This not only is incorrect but makes absolutely no sense.

The text accompanying the 1999 staff model does not argue that LEC profits have been mismeasured. The author only argues that, in his opinion, part of booked profits should be categorized as opportunity cost ("normal" profit) and part as "excess" profit. As a result, LEC capital expenses and therefore total LEC costs are adjusted downward to meet what the staff author claims are economic costs. However, this does not affect booked revenue. It is

[4] See column H of Chart D-9 in Appendix C of USTA's September 10, 1999 filing.

not affected at all either by the author's interpretation of profit or by his ultimate adjustment method. The only difference is that costs in the staff's 1999 model now are assumed to be below booked revenue rather than set equal to booked revenue as in its 1997 model.

The response to the author's statement that taxes and operating expenses require adjustments is equally straightforward. The downward adjustment to capital expense in the 1999 staff model changes neither labor nor material expenses. Therefore, there can be no change to operating expense as defined in the FCC model. Similarly, I feel confident in asserting that the author's reassignment of some fraction of dollar earnings from the "normal" (opportunity cost) to "excess" categories will have absolutely no impact on the Internal Revenue Service's view of the LECs' income tax liability. In any case, income taxes are not part of operating expenses in the ARMIS accounting system. Even if the staff believed it should adjust income taxes, that decision would have no effect on measured operating expense.

The staff's rewriting of LEC revenue and expense history introduces modeling bias. Moreover, the staff's decision to force revenue to equal cost is most curious. Creating the scenario where revenue exceeds cost would appear to have been the whole intent of the staff model. The simulation developed below removes this source of bias from the 1999 staff model.

1.e. Converting LEC Capital Accounts from Internal to External Rate of Return Frameworks Requires Symmetric Adjustments to the Capital Accounts for the Nonfarm Business Sector.

Both 1997 and 1999 staff models quantify X by establishing TFP and input price differentials comparing the performance of the LECs with firms in the U.S. nonfarm

business sector. In both models, the staff relies on BLS data for the nonfarm sector. BLS measures nonfarm TFP and input price growth using a model based on an internally calculated rate of return, i.e., total revenue equals total cost and all measured profits are assumed to reflect opportunity costs. One nice feature of the 1997 staff model is that its adoption of an internal rate of return framework for the LEC capital accounts guarantees symmetry with the BLS accounts so that the computation of the TFP and input price differentials are computed on like concepts. The 1999 staff model introduces an asymmetry.

The authors of the FNPRM introduce two bases for their recommended conversion to an external rate of return standard: (i) the LECs may not be in a perfectly competitive industry and (ii) they may not be in long run equilibrium. It is true that imperfect competition may lead to excess profits and, even if perfectly competitive, firms may earn excess profits in the short run.[5] The differential nature of the staff's model, however, begs the question: What insures that the firms in the nonfarm business sector, to which BLS applies an internal rate of return framework, are perfectly competitive firms in long run equilibrium? If the staff chooses to measure the performance of the LECs using an external rate of return structure, symmetry requires that the staff make similar adjustments to the BLS series. Doing so would reduce the resulting X-Factor.

If the Commission adopts the staff's 1999 model as presently proposed, it ultimately will have to confront its asymmetric treatment of both TPF and input price differentials. The proposed asymmetry is indefensible and is perhaps one reason that compelled the Commission to adopt an internal rate of return model in May 1997.

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[5] The FNPRM elaborates on the importance of the long run equilibrium assumption at p. 40 of the Nov. 12, 1999 document. "The measure of TFP growth obtained by conventional means (an internal rate of return model) is not, however, appropriate whenever firms are not in a long run cost minimizing equilibrium. A firm is not in long run equilibrium whenever the firm's input-output bundle is other than

2. ECONOMIC PRINCIPLES UNDERLYING TFP MODELING REQUIRE THAT SEVERANCE PAYMENTS BE INLCUDED IN LEC LABOR EXPENSE

The authors of the 1999 staff model adjust reported labor expense downward for years 1991-98 by amounts estimated to reflect the LECs' severance payments. The staff does not argue that the incentive payments were not incurred, nor does the staff take the position that these separation payments are not legitimate business expenses. The staff's rationale and modeling decision are described in the following two sentences.

> To have a labor price series meaningful for TFP analysis, it is necessary to adjust for the impact of the exogenous changes in labor compensation and accounting rules. This is accomplished by adjusting the labor compensation series to net out one-time charges for such things as buyouts and accounting rule changes. (FNPRM, p. 50)

The first sentence is totally in error. First, incentive payments made by the LECs to their employees are not exogenous events imposed on the companies by some external force. They reflect endogenous decisions presumably made by rational firms. Second, exogenous factors should not automatically be excluded from the measure of labor expense entering the TFP calculation. For example, a government-mandated change in Social Security tax rates is an exogenous event but, because it affects compensation payments, it necessarily enters the calculation of labor expense. Third, by netting out severance payments without allocating them either to labor expense in other years or to capital expense in the same year as a charge against earnings, the staff is effectively "disallowing" severance expenses. In short, the staff's disallowance is consistent only with the premise that it believes that the LECs, if rational, cost-minimizing firms, should simply have fired the excess laborers. Because severance payments (in the staff's opinion) are unnecessary "gifts" to exiting employees, they should not be recognized as legitimate labor expenses.

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corresponding to a point on the long run unit cost curve. If the firm is not in long run equilibrium, then profit is not zero."

Regardless of how this issue might have been adjudicated under the old rate-of-return paradigm, disallowing severance payments makes absolutely no economic sense under price-cap regulation. Facing a predetermined X, with the threat of having to cover all costs and the promise of retaining earnings achieved in excess of X, the LECs have absolutely no incentive to needlessly pay laborers any more than is required by market forces. And this brings me to my last point.

Fourth, those staff members who designed this "adjustment" to labor expense appear to misunderstand the economic principles underlying input price measurement in proper TFP modeling. Derived either from production or cost functions, the TFP model requires that the measured input price for labor reflect the incremental cost that a cost-minimizing firm would incur to hire additional labor and/or retain its existing labor force. The last phrase is critical and explains why the LECs willingly incurred (and incur) real severance payments instead of simply firing sizable numbers of laborers. Absent these payments, two effects would result. First, morale among retained workers would decline. Second, it would become increasingly difficult (i.e. expensive) to hire quality laborers. The first translates to lower marginal productivity; the second results in higher wages and salaries to compensate workers for the risk they would now bear through uncompensated separation. In short, the LECs rationally incur severance payments just as do so many companies throughout the economy.

The 1999 staff model assumes labor force reductions during the 1991-98 period without incentive payments would have had no impact on labor productivity or future wage levels. That makes no economic sense and flies in the face of firm behavior observed in the U.S. labor market. Market forces require that the LECs make severance payments. Proper TFP modeling requires that this real, market-driven phenomenon be recognized in labor expense.

TFP accounting principles require that severance payments be recognized as labor expense—as they are in the 1997 staff model. Though less defensible, the staff's only

alternative would be to remove severance payments from the labor expense category and reassign them to capital expense, as charges against earnings. Such a reallocation of expense would reduce the cost-share weight on slowing growing labor input and increase the weight on faster growing capital input. This would result in a lower measured TFP growth rate for the LECs and therefore a lower X. Short of this alternative, economic principles require that the staff retain its treatment of labor expense as defined in its 1997 model. This is the position adopted in the simulation presented later in this study.

3. ACCESS LINES ARE A MORE APPROPRIATE MEASURE OF LOCAL OUTPUT THAN IS THE NUMBER OF LOCAL CALLS

The staff proposes that the measure of local output be changed from the number of local calls used in the staff 1997 model to dial equipment minutes (DEMs). The staff believes this is necessary to account for rising minutes per call resulting from increased Internet use by local subscribers. (p. 23, FNPRM, Nov. 15, 1999) Internet use is certainly an exogenous event that may require modifying the measure of local output. However, careful analysis suggests that, under the Internet hypothesis, access lines rather than DEMs become the appropriate measure of output for calculating the X-Factor in the price-cap formula.

The choice of an appropriate output measure must follow from the very purpose of the X-Factor as a public policy tool. Since X is used to cap prices and therefore revenue, output in the X-Factor calculation must be defined as closely as possible to the unit measure on which market price is based. It is the specific source of local revenue that forms the proper external standard defining the measure of local output. MCI acknowledged as much in its November 1998 filing with the Commission: "Since local revenue is a combination of per line and per minute charges for local service, and of charges for CLASS services, the

most accurate estimator of demand for local services would be based on some weighted average of all of these types of outputs."[6] The Commission, however, long ago decided that it would adopt a single measure of local output for the sake of simplicity. As of May 1997, that measure was call volume. The staff now proposes DEMs as the alternative single measure.

An analysis of revenue sources reveals that 67% of intrastate revenue is flat rate or line volume related; only 33% of intrastate revenue is related to usage. Focusing more narrowly on the sources of local revenue, more than 80% is generated from lines.[7] Only a very small portion is derived from per-use rates. To have an economically meaningful X-Factor, the measure of output used in the model must correspond to outputs driving revenue growth. With this criterion in mind, the analysis of revenue sources suggests that the number of access lines is clearly a superior candidate to either calls or DEMs. If the Commission is intent on changing the measure of local output but wants a single quantity measure, the number of access lines is the only economically meaningful choice.

Table 4 summaries the growth rates of calls, DEMs, and access lines. Two empirical observations are relevant. First, since local revenue growth is tied mainly to line growth, the erratic movement in DEMs over the past 15 years would introduce a substantial bias in the Commission's X-Factor. The –0.1% and 11.5% growth rates for DEMs in 1990 and 1997, respectively, illustrate the point. Second, the fact that access line growth rates are typically intermediate to those for calls and DEMs suggests that access line growth is a good proxy for any weighted measure of local output growth. For example, as discussed above, a reasonable measure of local output growth would be a weighted average of call, DEM, and line growth rates. Consider access line growth relative to the other growth rates in Table 4. In the 1994-98 period, for example, installed access lines increased at a 3.9% annual rate while calls and DEMs increased at 3.3% and 6.8% annual rates, respectively.

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[6] MCI Reply Comment dated November 9, 1998, CC Docket 94-1, p. 26.
[7] Telcordia survey performed for USTA, Spring 1999.

Table 4

Local Output
(Growth Rates)

Year	Local Calls	Local DEMs	Access Lines
1985	1.7%	1.1%	2.9%
1986	1.6	0.6	3.0
1987	-0.6	4.6	0.0
1988	3.6	1.8	3.0
1989	3.7	1.2	2.6
1990	3.2	-0.1	3.4
1991	3.5	3.0	1.4
1992	3.2	5.3	3.0
1993	3.2	5.3	3.0
1994	4.1	4.8	2.7
1995	4.3	4.8	4.0
1996	3.1	8.5	4.5
1997	2.6	11.5	4.9
1998	2.6	4.4	3.6
1991-98	3.3	6.0	3.4
1994-98	3.3	6.8	3.9

Not only would access line growth receive an 80% weight in any weighted average, but its growth rates relative to those for calls and DEMs suggest that access line growth is likely a reasonable proxy for that weighted average. Without doubt, the weighted average would be closer to the reported rates for access lines than to those for local DEMs. If the Commission maintains its long-standing policy of using a single metric for an output, access lines become the economically meaningful variable for local output. Moreover, access lines already are used elsewhere in the FCC's model, as the measure of output corresponding to end-user interstate revenues. In the simulation developed below, access lines rather than DEMs are substituted for local calls.

4. THE 1999 STAFF MODEL USES AN INCORRECT INPUT PRICE SERIES FOR THE U.S. NONFARM BUSINESS SECTOR

The 1999 staff model introduces an input price series for the U.S. nonfarm business sector that, quite frankly, is not what it purports to be. The text in Appendix B offers the following source description:

> The input price differential...is computed as the percentage change in input prices for the aggregate economy less the percentage change in LECs' input prices. The measure of aggregate input price change used is the Nonfarm Business Sector Input Price Index compiled by the Bureau of Labor Statistics of the U.S. Department of Labor.[54]

[54]The series is quarterly and is taken from Table 2: Private Nonfarm Business: Productivity and Related Indexes, 1948-97. It is available via the Bureau of Labor Statistics Internet site at http://www.bls.gov

I contacted BLS and found that the input price series that corresponds to the nonfarm business sector TFP index produced by BLS (a) is not available quarterly, (b) is not available on the BLS web site, and (c) has not changed since BLS provided the series to me for the USTA update of the staff 1997 model as filed with the Commission on September 10, 1999. I have not been able to determine the source of the staff 1999 series but I am

convinced that it is not the input price index that corresponds to the inputs used by BLS in its calculation of TFP growth for the U.S. nonfarm sector. The simulation below uses the correct BLS price index.

5. THE 1999 STAFF MODEL INCLUDES INCORRECT AND/OR INCONSISTENT DATA POINTS

The 1999 staff model incorporates a number of data errors quite apart from the methodological errors discussed above. Each data error is discussed below and previously was identified in detail in one or more of three USTA filings: (1) Appendix F in Attachment D to USTA Comments dated October 26, 1998; (2) Appendix A to Gollop report "Current Issues in Modeling the Commission's X-Factor: A Rebuttal of IXC Arguments" filed in USTA ex parte dated April 14, 1999; and (3) Appendix B to Gollop report "The FCC X-Factor: 1996-98 Update" filed with USTA ex parte dated September 10, 1999. Appendix A to this report is a compendium of these past filings.

1) Most of the data entries for 1998 differ from those found in USTA's update of the Commission's 1997 model (filed September 10, 1999). The entries in the 1999 staff model typically are higher than those found in USTA's update. The difference is explained by the staff's inclusion of Southern New England Telephone (SNET) in its 1998 data. SNET, however, does not appear in the staff's 1985-97 data series. The USTA updates and following simulation exclude SNET to insure consistency over the complete 1985-98 data set.
2) Both 1997 and 1998 data entries for special access lines in the staff model are in error. The correct data values appear in the USTA update filed with the Commission on September 10, 1999 and are used in the simulation developed below.

3) Both USTA and the FCC staff estimated a 1998 value for intrastate DEMs. The higher USTA number is adopted in the following simulation since it produces a more conservative result (i.e., it produces a higher X). The provisional entry will be revised once final data are available.

4) USTA previously demonstrated in its Comment dated October 26, 1998 and its ex parte filing dated April 14, 1999 that the published 1996 data entry for labor compensation was obviously in error.[8] Published data adopted by the staff in its 1999 model show an annual compensation per employee series with the following trend from 1995 to 1997: $46,717, $54,601, and $51,605.[9] Even Dr. Norsworthy, AT&T's productivity expert, acknowledged that this series contained an obvious error: "Total labor compensation for the RBOCs shows an implausibly large increase in 1996, followed by a similar decrease in 1997."[10] USTA made clear in its October 1998 filing that the upward spike observed for 1996 labor compensation is the result of changing FCC reporting requirements for labor compensation. USTA therefore replaced the reported 1996 compensation with an estimate whose calculation is fully described on page 5 of Attachment D to USTA's October Comment.[11] This led to a 1995-97 per employee labor compensation series of $46,717, $49,100, and $51,605. Only the 1996 data point is replaced.[12] Simple inspection of the contrasting annual wage series leaves little doubt as to which series better satisfies the Commission's economic meaningfulness standard. This latter series has been used in all USTA updates of the FCC May 1997 model and is also used in the simulation developed in the following section of this report.

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[8] Attachment D to USTA's Comment dated October 26, 1998, Docket 94-1; and Gollop report "Current Issues in Modeling the Commission's X-Factor: A Rebuttal of IXC Arguments" filed with USTA ex parte dated April 14, 1999

[9] Table B-5, FNPRM, dated November 12, 1999.

[10] Attachment A to AT&T Reply Comment dated November 9, 1998, CC Docket 94-1, p. 2.

[11] Chart D6 in Appendix A to Attachment D to USTA's Comment dated October 26, 1998, Docket 94-1.

[12] As explained in USTA's October 1998 filing, reported operating expense for 1996 is not affected by USTA's correction for labor compensation. The reduction in labor compensation results in a corresponding increase in material expense for that year.

The labor price series adopted by the staff in its 1999 model differs in two important respects from that used by USTA in its past updates of the FCC model and in the simulation discussed in the following section. The staff labor price series is based on (i) the 1996 data error discussed immediately above and (ii) ad hoc "disallowances" for LEC severance payments discussed in section 2 above. A comparison of the staff's proposed labor price series in its 1999 model with not only the series applied by USTA but with the labor price series reported for the U.S. nonfarm business sector makes clear the extent (and importance) of these two errors alone in the 1999 staff model.

Table 5 presents the three series in index form. The USTA and 1999 staff labor price series are taken, respectively, from USTA's 1998 update of the Commission's May 1997 model (filed September 1999) and Table B-5 in the Commission's FNPRM (November 1999). The corresponding price series for workers in the nonfarm sector is taken from Table B-49 in the Economic Report of the President (February 1999). This latter series reflects wages, salaries and benefits and therefore is directly comparable to the USTA and staff labor price indexes. A simple visual comparison of the three series shows that LEC labor prices, as measured by the staff in its 1997 model and in USTA updates, move quite similarly to hourly compensation rates in the nonfarm economy. Both series increase steadily over the 1990-98 period. In contrast, labor prices in the staff's 1999 model (i) remain relatively flat from 1990 to 1994 while nonfarm hourly compensation increased by nearly 15%, (ii) increase by an inexplicable 23 percentage points in one year (1995 to 1996) while U.S. compensation increased by only 4 points, and (iii) then falls by three percentage points from 1996 to 1997 as the U.S. series increased by 4.5 percentage points. The staff offers no explanation for why LEC hourly compensation rates should be expected to move in a pattern so unrelated to U.S. experience. Since the X-Factor depends importantly on the labor price series, Table 5 illustrates persuasively, for the labor component alone, the extent of data bias underlying the staff's 1999 model.

Table 5

Labor Price Series

Year	1997 Staff Model USTA 9/99 Filing (Chart D6)	Staff 1999 Model FCC 11/99 FNPRM (Table B-5)	U.S. Nonfarm Business Sector Economic Report of the President (Table B-49)
1990	1.00	1.00	1.00
1991	1.04	1.01	1.05
1992	1.05	0.99	1.10
1993	1.14	1.04	1.13
1994	1.18	1.03	1.15
1995	1.18	1.07	1.18
1996	1.24	1.30	1.22
1997	1.30	1.27	1.26
1998	1.35	1.31	1.32

6. CORRECTED 1999 STAFF MODEL

The 1999 staff model has been modified to correct the errors identified in the preceding five sections of this report. In particular, the following adjustments have been made:

1) An external rate of return adjustment like that proposed in the 1999 staff model is applied, but with three modifications. First, movements in LEC opportunity costs are pegged to movements in the rate of return reported for the 875 largest Value Line industrials (Table 1). Second, the adjustment was made only to that portion of LEC property income that corresponds to earnings (Table 2). Third, no adjustment is made to property income for years 1985-91, a period under rate-of-return regulation. Each methodological step is displayed in full in Chart D9 in Appendix B to this report. In brief, LEC earnings per unit of capital are adjusted by the full basis point change in the Value Line rate of return to obtain an external rate of return for LEC opportunity costs. The result is multiplied by the LECs' capital stock to measure earnings corresponding to opportunity costs. These imputed earnings are then added to that portion of property income unaffected by the adjustment, i.e., the portion corresponding to depreciation, amortization, and income taxes. The adjusted series for property income, rental price, and total LEC costs are reported in Appendix B in columns H and G of Chart D9 and column D of Chart D10, respectively.

2) As required by the conversion from an internal to an external rate of return model, no change is made to LEC revenues, taxes, or operating expenses. Intrastate and interstate revenue totals and LEC operating expenses are returned to the data series found in USTA's update of the 1997 staff model (filed with the Commission on September 10, 1999).

3) Severance payments are included in LEC labor expense totals. The corrected model has the same labor expense series as found in USTA's update of the 1997 staff model. See column B of Chart D6 in attached Appendix B.

4) Local output is measured by the number of access lines rather than by calls or local DEMs. See the fourth column of Chart D5 in Appendix B.
5) The correct BLS input price series for the nonfarm business sector is used. See column B of Chart D1 in attached Appendix B.
6) Data point errors in the staff model are corrected as described in section 5 above.

Table 6 presents a comparison of the 1997, uncorrected 1999, and corrected 1999 staff models. The X-Factors reported for the 1997 model are taken from USTA's update of that model filed with the Commission on September 10, 1999. The uncorrected 1999 staff results are taken from the Table B-12 in Appendix B in the November 15, 1999 FNPRM. The corrected 1999 staff results are taken from Chart D1 in Appendix B to this report.

The differences between the uncorrected and corrected 1999 staff models have already been summarized in the six items introducing this section. The differences between the 1997 and corrected 1999 staff models can be summarized as follows. For the 1986-91 period, the corrected 1999 model substitutes access lines for local calls. In all other respects the two models are identical for that subperiod. For the 1992-98 period, there are two important differences. Access lines are used in place of local calls and the embedded internal rate of return is replaced with an economically meaningful external rate of return.

The subperiod averages at the bottom of Table 6 indicate that the three models generate considerably different results for the price-cap period. Though the models produce very different annual results for the pre-1991 era, the five-year 1986-90 averages differ only slightly. The differences post 1990, however, are striking. The 1999 staff model as designed by the staff in the FNPRM raises the average annual X-Factor by more than two full percentage points in the full 1991-98 period. However, when corrected so as to be made consistent with economic principles, the corrected 1999 model reduces X relative to the 1997 staff model. The conversion from calls to access lines raises LEC output and,

Table 6

X-Factors

Year	1997 Staff Model	1999 Staff Model	
		Uncorrected	Corrected
	USTA 9/99 Filing	FCC 11/99 FNPRM	Appendix B to this Report
1986	-1.13%	11.53%	-0.54%
1987	6.36	4.19	6.98
1988	6.42	1.81	6.75
1989	6.52	5.14	6.22
1990	8.99	4.87	8.48
1991	6.06	3.61	6.18
1992	3.08	8.45	1.68
1993	3.51	8.49	-0.30
1994	5.47	3.62	1.53
1995	6.20	6.52	2.98
1996	1.98	7.73	4.98
1997	3.62	6.71	3.55
1998	3.03	5.54	5.73
1986-90	5.43	5.51	5.58
1991-98	4.12	6.33	3.29
1994-98	4.06	6.02	3.76

other things equal, increases the X-Factor. However, converting from an internal to an appropriate external rate of return reduces X. On net, X-Factors are reduced by an average 0.83 percentage points per year in the 1991-98 period. If one looks at the most recent five-year period, the interval used by the Commission to set X in its May 1997 order, the 1999 staff model raises X by nearly two percentage points relative to the 1997 model, while the corrected 1999 model generates an X-Factor 0.3 percentage points lower than that computed by the 1997 staff model.

The important conclusion to be drawn from Table 6 is that the X-Factor is quite sensitive to modeling errors. In particular, the importance of properly modeling an external rate of return should be evident. If the Commission decides to endorse an X-Factor model calibrated on an external rate of return, it is incumbent on the Commission to implement the model in a way consistent with sound economic principles.

This importance of this point cannot be overemphasized. Properly implementing an external rate-of-return framework will not be an easy task. It is important to note that while the corrected staff model presented in this report illustrates how one would go about properly converting the staff's model to an external rate of return status, the empirical comparison presented in Table 6 should be considered to be an illustration only. First, as explained in section 1.b. above, the portion of LEC property income that corresponds to the dollar earnings subject to adjustment must be reduced beyond the levels reported in Table 2. The "earnings" series used for the corrected 1999 staff model as an illustration in this report include capital expense items that should not be subject to adjustment (e.g., property taxes and business transfers). Second, no external rate of return adjustment is made at present to the BLS TFP and input price series for the U.S. nonfarm business sector though, as argued in section 1.e. above, symmetry requires that such an adjustment would be absolutely necessary if the Commission were to adopt the staff's recommended external rate of return framework. Implementing an external rate-of-return framework that properly addresses these issues would require considerable effort.

7. RECENT BEA REVISIONS TO U.S. NATIONAL ACCOUNTS REDUCE THE X-FACTOR

The Bureau of Economic Analysis released revisions to its GDP accounts on October 28, 1999. A number of factors contributed to the revision but the single largest one was BEA's treatment of computer software. In the past, software was treated as an intermediate input and therefore did not enter the GDP accounts. Now it is treated as a capital good. A November 8, 1999 Business Week article summarizes well the effect of the GDP revision on nonfarm statistics:

> The U.S. truly has seen the birth of a New Economy over the past several years. That's one way to read the results of a comprehensive revision of historical data on the gross domestic product released on Oct. 28 by the Commerce Dept.'s Bureau of Economic Analysis.
>
> The most stunning data in the report are about the acceleration of productivity in the 1990s. Official revisions of productivity data, incorporating the latest output figures from Commerce, won't be released by the Labor Dept. until Nov. 12. But a BUSINESS WEEK analysis of the new data from the Commerce Dept. shows that nonfarm business productivity growth in this decade will likely be revised upward, to roughly 2% a year, from 1.4%. Productivity growth will be boosted for the 1980s as well, but not by as much....
>
> A new calculus for software investments accounted for about two-thirds of the upward revision in GDP. And since software sales are growing far faster than the economy as a whole, adding them into the GDP raises the economy's official growth rate—and will likely continue doing so for years to come.

As advertised in the Business Week article, BLS released revised labor productivity growth rates for the nonfarm economy this past November. (Multifactor indexes will not be available until next spring.) Annual rates of labor productivity growth increased from previously reported 1.15% and 1.43% annual rates over the 1985-98 and 1991-98 periods to 1.69% and 1.96% annual rates, respectively. (www.bls.gov) Over both the full study period used in the FCC models and the shorter price cap period, the GDP revisions produce an additional 0.5 percentage points per year in nonfarm productivity growth.

The BEA/BLS revisions, when incorporated into the Commission's model, will decrease both the TFP differential and the measured X-Factor. No adjustment is incorporated into the present analysis because BLS has not yet produced the requisite TFP numbers and the 0.5% increment noted above will be reduced a bit due to the inclusion of the now faster growing capital input in the TFP metric. However, in anticipation of the BLS release midyear 2000, provision should be made now for the incorporation of the revised nonfarm series as soon as it is released by BLS.

8. CONCLUSION: PROPER PRODUCTIVITY ACCOUNTING

Changes should be made to the Commission's 1997 model only when clear and unambiguous errors have been detected. As the staff acknowledges in the current FNPRM in a section discussing incentive regulation: "The simple fact that the **X-factor is fixed** and independent of the actual costs incurred creates an incentive for the firm to be efficient." (p. 42, FNPRM, Nov. 15, 1999; emphasis added) It is the lure of profits and the regulatory promise that firms may keep those profits once earned that stimulates productivity growth. In short, properly designed incentive regulation requires that the "rules of the game" not be changed. Ex post "adjustments" designed to reduce earnings run the risk of diminishing incentives and therefore the efficiency payoffs to be shared between firms and consumers.

Should the LECs be suspicious of the "adjustments" proposed by the staff for the Commission's 1997 model? The answer is found in the introductory section to the November 1999 FNPRM:

> A third alternative is to prescribe an X-factor based on the results of another staff study which directly determines, from aggregate interstate expenses and revenues, the X-factor that would have produced a competitive level of capital compensation in the interstate jurisdiction during the period between performance reviews. (p. 2, FNPRM, Nov. 15, 1999)

In place of an X determined from an analysis of productivity performance defined on a set of economically meaningful data accounts, the staff recommends an X backed out of a rate-of-return analysis based on accounting separations. In addition, it cannot have escaped the LECs' notice that each and every "adjustment" proposed by the staff to the Commission's present X model coincidentally leads to a higher X.

This said, if clear and unambiguous errors are found to exist in the May 1997 model, modifications should be made. Alternatively, errors embedded in the staff's 1999 proposal must not be transported to the Commission's X-Factor model. The analysis developed in this report suggests that only two of the staff's proposed changes should receive serious consideration by the Commission. One tends to raise X, the other to lower it. First, the staff argues that the exogenous effect of rising Internet usage makes calls no longer a meaningful measure of local output. This position is consistent with economic principles but these same principles identify access lines, not local DEMs, as the meaningful successor metric. Increasing faster than calls, the substitution of access lines, with second-line growth largely driven by Internet and fax use, raises X. Second, while economic principles can be used to support the use of either internal or external rates of return in differing applications, these same economic principles are uncompromising when it comes to how external rates of return are to be incorporated into the rental price of capital. They must be applied only to that portion of property income corresponding to LEC earnings and must measure the LECs' true opportunity costs. Proper capital cost accounting leads to a lower X as reported in Table 6, the expected result given the Commission's aggressive application of a 6.5% X-Factor not otherwise justified by the Commission's own model.

Both the FCC's 1997 model as well as a properly designed 1999 staff model lead to the same policy conclusion. A straightforward application of elementary economic principles indicates that the present 6.5% X-Factor is not justified by any meaningful measure of LEC performance. The FCC's own model (May 1997) as well as the corrected 1999 staff model reveal that the LECs have never achieved a 6.5% X in any year since the

initiation of price-cap regulation. The 1991-98 and 1994-98 average X-Factors in the Commission's 1997 model were 4.12 and 4.06, respectively. The corresponding averages in the corrected 1999 staff model are 3.29 and 3.76, respectively.

APPENDIX A

Compendium of Data Errors

Previously Filed with the Commission

FOLLOWING 5 PAGES

WERE FILED AS

APPENDIX F IN ATTACHMENT D

TO USTA COMMENTS

DATED OCTOBER 26, 1998

FCC STAFF'S PRODUCTIVITY MODEL (6.5% X-factor basis)
1996-97 BOC Industry DATA UPDATE
PAGE 1

FCC CHART D2, D3	FCC Model 1995	UPDATE 1996	UPDATE 1997
Inter. End User Revenue	$5,770,285	$5,930,960	$6,268,026
S.O.C.C., Table 2.9, line 154	3.23%	2.78%	5.68%
Inter Switched Access	$9,332,869	$9,409,639	$8,763,815
S.O.C.C., Table 2.9, line 155	0.42%	0.82%	-6.86%
Inter Special Access	$2,529,667	$3,070,598	$3,851,028
S.O.C.C., Table 2.9, line 156	14.10%	21.38%	25.42%
TOTAL INTERSTATE REVS	*$17,632,821*	*$18,411,197*	*$18,882,869*
	3.11%	*4.41%*	*2.56%*
Local Service Revenue	$37,684,860	$40,523,387	$42,460,592
S.O.C.C., Table 2.9, line 153	5.39%	7.53%	4.78%
Intra. Toll & Access	$13,123,225	$12,987,476	$12,308,613
S.O.C.C., Table 2.9, l 157+174	-8.59%	-1.03%	-5.23%
TOTAL INTRASTATE REVS	*$50,808,085*	*$53,510,863*	*$54,769,205*
	1.38%	5.32%	2.35%
GRAND TOT REVS (-MISC)	*$68,440,906*	*$71,922,060*	*$73,652,074*
	1.82%	*5.09%*	*2.41%*

FCC STAFF'S PRODUCTIVITY MODEL (6.5% X-factor basis)
1996-97 BOC Industry DATA UPDATE
PAGE 2

FCC CHART D4, D5	FCC Model 1995	UPDATE 1996	UPDATE 1997	
Switched Acc Line -*Mobile*	119,887,506	125,333,996	131,458,355	
SOCC Table 2.10	4.01%	4.54%	4.89%	
Switched Acc Minutes	334,981,582	**362,159,904**	**387,587,697**	Estimated, using
SOCC Table 2.10	*332,335,499*	*359,299,134*	*384,526,068*	growth rates shown
	12.30%	*8.11%*	*7.02%*	on to FCC '95 quantity
Special Acc Lines *Dig+Anlog*	16,107,677	20,775,150	24,479,958	< revised
SOCC Table 2.10	16.52%	28.98%	17.83%	vs. reported
Local Call Volume	409,383,799	422,262,867	433,086,737	< revised
SOCC Table 2.10	4.27%	3.15%	2.56%	vs. reported
Intrastate DEMs	246,926,539	**258,038,233**	**269,649,954**	Est'd pending release
	4.91%	4.50%	4.50%	of Joint Board
				Monitoring Report
FCC CHART D6				
Total Employees	346,843	338,040	338,177	
Stat of C. C. Table 2.9, line 321	-5.54%	-2.54%	0.04%	
Total Compensation $000	$16,203,522	$16,597,889	$17,451,673	
Stat of C. C. Table 2.9, line 324	-5.54%	2.43%	5.14%	
		normalized vs. reported		

FCC STAFF'S PRODUCTIVITY MODEL (6.5% X-factor basis)
1996-97 BOC Industry DATA UPDATE
PAGE 3

FCC CHART D7	FCC Model 1995	UPDATE 1996	UPDATE 1997
TPIS - BOY	$209,325,562	$217,430,207	$227,317,120
SOCC, Tab 2.7 (Ac260-2111)	3.07%	3.87%	4.55%
Unadj. Additions	$15,374,568	$18,026,150	$18,253,199
SOCC, Tab 2.7 (Ac260-2111)	4.46%	17.25%	1.26%
TPIS - EOY	$217,430,207	$227,317,120	$236,896,179
SOCC, Tab 2.7 (Ac260-2111)	3.87%	4.55%	4.21%
Retires = BOY+Adds-EOY	*$7,269,923*	*$8,139,237*	*$8,674,140*
Depreciation Accruals	$15,358,553	$16,252,281	$16,667,034
SOCC Tabl 2.9, l 250+252	3.33%	5.82%	2.55%

FCC STAFF'S PRODUCTIVITY MODEL (6.5% X-factor basis)
1996-97 BOC Industry DATA UPDATE
PAGE 4

FCC CHART D8	FCC Model 1995	UPDATE 1996	UPDATE 1997
Operating Expense SOCC Tabl 2.9, line 280	$56,831,094 1.63%	$57,884,494 1.85%	$59,731,175 3.19%
Depreciation & Amortiz. SOCC Tabl 2.9, line 255	$15,556,284 3.24%	$16,377,242 5.28%	$16,758,832 2.33%
Employee Compensation *Stat of C. C. Table 2.9, line 324*	$16,203,522 -5.54%	$18,457,448 13.91%	$17,451,673 -5.45%
Materials = OpExp-Dep-Comp calc	*$25,071,288* *5.81%*	*$23,049,804* *-8.06%*	*$25,520,670* *10.72%*

USTA 1996/97 UPDATE OF FCC PRODUCTIVITY MODEL

MODEL DATA ADJUSTMENTS TO REPORTED BOC INDUSTRY DATA

Item	YEAR	Model Exhibit	Data Item	BOC Total REPORTED	BOC Total REVISION/Estimate	% CHG	EXPLANATION
1	1996	D5	Intrastate DEMs	Not released	258,038,233,255	4.50% over '95	Estimate, pending release of latest Joint Board Monitoring Report
2	1996	D4	Switch Acc Minutes	Not released	362,159,903,714	8.11% over '95	Estimate, pending Joint Board publication Used growth rates for Interstate interlata billed access minutes from Table 2.10, Stat. Of Comm. Common Carriers
3	1996	D6	Labor Compensation	$18,457,448,000	16,597,889,075	-10.07%	Normalized value substitued to reflect change in reporting basis after FCC clarification to include benefits $
1	1997	D5	Intrastate DEMs	Not released	269,649,953,751	4.50% over '96	Estimate, pending release of latest Joint Board Monitoring Report
2	1997	D4	Switch Acc Minutes	Not released	387,587,696,669	7.02% over '96	Estimate, pending Joint Board publication Used growth rates for Interstate interlata billed access minutes from Table 2.10, Stat. Of Comm. Common Carriers
3	1997	D5	Local Calls (000)	408,389,023,000	433,086,737,000	6.05%	Revision to New York Tel.
4	1997	D4	Special Acc Lines	27,891,558	24,479,958	-12.23%	Revision to US West Revision to New York Tel.

FOLLOWING PAGE

WAS FILED AS

APPENDIX A TO

GOLLOP REPORT

"CURRENT ISSUES IN MODELING THE COMMISSION'S X-FACTOR: A REBUTTAL OF IXC ARGUMENTS"

USTA EX PARTE

DATED APRIL 14, 1999

APPENDIX A

Data Updates for FCC Model

Output volume data for switched access minutes, intrastate DEMs, and local calls, not previously available to either USTA or AT&T for their respective October and November 1998 analyses, now are published in final form in the FCC Statistics of Communications Common Carriers and the Joint Monitoring Report. A complete summary of the data values at issue follows in Table 1. Underlined values identify data used in the FCC update.

Published data are used in the March 1999 USTA update in all instances except for special access lines in 1997. Published FCC data for 1997 special access lines do not reflect revisions to US West and New York Telephone data recently submitted to the Commission. In the two instances where provisional estimates are required, the estimate most favorable to the IXC position is adopted (the USTA estimate for switched access minutes in 1997 and AT&T's estimate for intrastate DEMs in 1997).

Table 1

(Underlined values identify data used in the FCC update.)

	Year	USTA Oct. 26, 1998	AT&T Nov. 9, 1998	New SOCCC and Joint Board Monitoring Report	Explanation
Switched Access Minutes	1996	362,159,903,714	362,602,512,000	363,445,050,000	Recently published
	1997	387,587,696,669	386,566,932,000	(not available)	
Intrastate DEMs	1996	258,038,233,000	263,719,641,000	263,719,641,000	Recently published
	1997	269,649,954,000	273,526,579,891	(not available)	
Local Calls	1997	433,086,737,000	437,613,306,121	433,128,073,000	Final FCC SOCCC reflects NY Tel revision
Special Access Lines	1997	24,479,958	27,891,558	28,051,449	USTA total reflects revisions to US West and NY Tel data

FOLLOWING 4 PAGES

WERE FILED AS

APPENDIX B TO

GOLLOP REPORT

"THE FCC X-FACTOR:

1996-98 UPDATE"

USTA EX PARTE

DATED SEPTEMBER 10, 1999

FCC STAFF'S TFP PRODUCTIVITY MODEL
(4th Report & Order, May 21, 1997, CC Docket 94-1)
USTA's UPDATE for 1998
(FCC SOCC 1998 BOC Data Tables adjusted for SNET merger for consistency)

FCC CHART D2, D3	FCC Model Data 1998	
Inter. End User Revenue S.O.C.C., Table 2.9, line 154	$7,807,872 24.6%	<- Annual change
Inter Switched Access S.O.C.C., Table 2.9, line 155	$7,275,241 -17.0%	
Inter Special Access S.O.C.C., Table 2.9, line 156	$4,815,249 25.0%	
TOTAL INTERSTATE REVS	$19,898,362 5.4%	
Local Service Revenue S.O.C.C., Table 2.9, line 153	$44,993,354 6.0%	
Intra. Toll & Access S.O.C.C., Table 2.9, l 157+174	$11,978,176 -2.7%	
TOTAL INTRASTATE REVS	$56,971,530 4.0%	
GRAND TOT REVS (-MISC)	$76,869,892 4.4%	

S.O.C.C. for 1998 refers to the FCC's "Preliminary Statistics of Communications Common Carrier dated May 28, 1999

FCC STAFF'S TFP PRODUCTIVITY MODEL
(4th Report & Order, May 21, 1997, CC Docket 94 -1)
USTA's UPDATE for 1998
(FCC SOCC 1998 BOC Data Tables adjusted for SNET merger for consistency)

FCC CHART D4, D5	FCC Model Data 1998	
Switched Acc Line -Mobile	136,170,133	
SOCC Table 2.10	3.6%	<- Annual change
Switched Acc Minutes	407,903,661	<-- Projection prior to Joint Board reporting
SOCC Table 2.10	*404,681,553*	<-- ADD 1,865,240 for Bell Atl. - North revision
	5.2%	
Special Acc Lines Dig+Anlog	31,620,187	<-- ADD 52,416 for SBC - Nevada revision, also
SOCC Table 2.10	29.2%	DECREASE 2,583,895 for Bell Atl. - North revisi
Local Call Volume	444,538,659	<-- DECREASE 9,796,480 for Pacific, NV revisi
SOCC Table 2.10	2.6%	
Intrastate DEMs	296,776,339	<-- Projection prior to Joint Board reporting
	8.5%	
FCC CHART D6		
Total Employees	338,404	
Stat of C. C. Table 2.9, line 321	0.1%	
Total Compensation $000	$18,128,861	<-- ADD $207,702 for US West revision
Stat of C. C. Table 2.9, line 324	3.9%	

FCC STAFF'S TFP PRODUCTIVITY MODEL
(4th Report & Order, May 21, 1997, CC Docket 94 -1)
USTA's UPDATE for 1998

(FCC SOCC 1998 BOC Data Tables adjusted for SNET merger for consistency)

FCC CHART D7	FCC Model Data 1998	
TPIS - BOY	$236,896,179	
SOCC, Tab 2.7 (Ac260-2111)	4.2%	<- Annual change
Unadj. Additions	$18,553,791	
SOCC, Tab 2.7 (Ac260-2111)	1.6%	
TPIS - EOY	$248,970,288	
SOCC, Tab 2.7 (Ac260-2111)	5.1%	
Retires = BOY+Adds-EOY	$6,479,681	<-- *calc*
Depreciation Accruals	$17,154,619	
SOCC Tabl 2.9, l 250+252	2.9%	

FCC STAFF'S TFP PRODUCTIVITY MODEL
(4th Report & Order, May 21, 1997, CC Docket 94 -1)
USTA's UPDATE for 1998

(FCC SOCC 1998 BOC Data Tables adjusted for SNET merger for consistency)

FCC CHART D8	FCC Model Data 1998	
Operating Expense	$60,836,253	
SOCC Tabl 2.9, line 280	1.9%	<- Annual change
Depreciation & Amortiz.	$17,306,863	
SOCC Tabl 2.9, line 255	3.3%	
Employee Compensation	$18,128,861	<-- same value as on Chart D6
Stat of C. C. Table 2.9, line 324	3.9%	
Materials = Op.Exps.-Deprec.-Compens.	$25,400,529	<-- *calc*
	-0.5%	

APPENDIX B

Corrected 1999 Staff Model

Chart D1: Components of FCC LEC Price Cap X-Factor [Excluding CPD]

	Input Price Growth Rates			Total Factor Productivity Growth Rates			LEC Price/Productivity Differential
Year	Total RBOCs A	U.S. Nonfarm Business Sector B	Differential C=B-A	Total RBOCs D	U.S. Nonfarm Business Sector E	Differential F=D-E	G=C+F
1984							
1985							
1986	5.20%	2.33%	-2.87%	3.43%	1.10%	2.33%	-0.54%
1987	0.72%	3.45%	2.73%	3.85%	-0.40%	4.25%	6.98%
1988	-1.39%	5.02%	6.41%	0.65%	0.30%	0.35%	6.75%
1989	-2.40%	2.42%	4.82%	1.60%	0.20%	1.40%	6.22%
1990	1.86%	3.31%	1.45%	6.32%	-0.70%	7.02%	8.48%
1991	-0.69%	1.77%	2.46%	2.30%	-1.41%	3.72%	6.18%
1992	3.25%	3.15%	-0.10%	3.40%	1.61%	1.78%	1.68%
1993	6.26%	2.18%	-4.09%	3.88%	0.10%	3.78%	-0.30%
1994	3.08%	3.37%	0.28%	1.65%	0.40%	1.25%	1.53%
1995	4.20%	2.61%	-1.58%	4.86%	0.30%	4.56%	2.98%
1996	3.40%	3.00%	-0.40%	6.86%	1.48%	5.38%	4.98%
1997	2.03%	2.30%	0.27%	3.67%	0.39%	3.28%	3.55%
1998	1.41%	2.69%	1.28%	5.04%	0.59%	4.45%	5.73%
Averages							
[1986-94]	1.77%	3.00%	1.23%	3.01%	0.13%	2.88%	4.11%
[1986-95]	2.01%	2.96%	0.95%	3.19%	0.15%	3.04%	4.00%
[1987-95]	1.65%	3.03%	1.38%	3.17%	0.04%	3.12%	4.50%
[1988-95]	1.77%	2.98%	1.21%	3.08%	0.10%	2.98%	4.19%
[1989-95]	2.22%	2.69%	0.46%	3.43%	0.07%	3.36%	3.82%
[1990-95]	2.99%	2.73%	-0.26%	3.74%	0.05%	3.69%	3.42%
[1991-95]	3.22%	2.62%	-0.61%	3.22%	0.20%	3.02%	2.41%
[1986-98]	2.07%	2.89%	0.82%	3.66%	0.30%	3.35%	4.17%
[1987-98]	1.81%	2.94%	1.13%	3.67%	0.24%	3.44%	4.56%
[1988-98]	1.91%	2.89%	0.98%	3.66%	0.30%	3.36%	4.34%
[1989-98]	2.24%	2.68%	0.44%	3.96%	0.30%	3.66%	4.10%
[1990-98]	2.76%	2.71%	-0.05%	4.22%	0.31%	3.91%	3.87%
[1991-98]	2.87%	2.63%	-0.23%	3.96%	0.43%	3.53%	3.29%
[1992-98]	3.38%	2.76%	-0.62%	4.19%	0.70%	3.50%	2.88%
[1993-98]	3.40%	2.69%	-0.71%	4.33%	0.54%	3.79%	3.08%
[1994-98]	2.82%	2.79%	-0.03%	4.42%	0.63%	3.79%	3.76%

Chart D2: RBOC Interstate Revenues

Year	End User A	Interstate Switched Access B	Special Access C	Total Interstate D = A + B + C
1984				
1985	$1,499,413,893	$10,906,203,190	$1,960,688,644	$14,366,305,727
1986	$2,400,475,814	$10,484,265,170	$2,574,800,716	$15,459,541,700
1987	$3,090,639,929	$9,611,996,187	$2,657,677,439	$15,360,313,555
1988	$3,604,221,000	$9,662,529,000	$2,539,698,000	$15,806,448,000
1989	$4,398,692,000	$9,092,575,000	$2,253,922,000	$15,745,189,000
1990	$4,679,142,000	$8,595,750,000	$2,209,064,000	$15,483,956,000
1991	$4,828,177,000	$8,514,130,000	$2,119,037,000	$15,461,344,000
1992	$4,963,262,000	$8,650,880,000	$2,153,565,000	$15,767,707,000
1993	$5,244,094,000	$8,999,065,000	$2,097,997,000	$16,341,156,000
1994	$5,589,662,000	$9,293,783,000	$2,217,125,000	$17,100,570,000
1995	$5,770,285,000	$9,332,869,000	$2,529,667,000	$17,632,821,000
1996	$5,930,960,000	$9,409,639,000	$3,070,598,000	$18,411,197,000
1997	$6,268,026,000	$8,763,815,000	$3,851,028,000	$18,882,869,000
1998	$7,807,872,000	$7,275,241,000	$4,815,249,000	$19,898,362,000

Chart D3: RBOC REVENUES (Excluding Miscellaneous Services)

Year	Local Service A	Intrastate Toll and Intrastate Access B	Interstate C	Total D = A + B + C
1984				
1985	$26,960,554,164	$13,047,095,682	$14,366,305,727	$54,373,955,573
1986	$28,626,174,049	$13,538,946,795	$15,459,541,700	$57,624,662,544
1987	$29,150,842,991	$14,166,723,124	$15,360,313,555	$58,677,879,670
1988	$29,226,988,000	$14,994,975,000	$15,806,448,000	$60,028,411,000
1989	$29,973,157,000	$14,868,219,000	$15,745,189,000	$60,586,565,000
1990	$30,699,085,000	$15,014,729,000	$15,483,956,000	$61,197,770,000
1991	$32,059,008,000	$14,522,276,000	$15,461,344,000	$62,042,628,000
1992	$33,359,990,000	$14,225,181,000	$15,767,707,000	$63,352,878,000
1993	$34,598,957,000	$14,496,831,000	$16,341,156,000	$65,436,944,000
1994	$35,758,637,000	$14,355,983,000	$17,100,570,000	$67,215,190,000
1995	$37,684,860,000	$13,123,225,000	$17,632,821,000	$68,440,906,000
1996	$40,523,387,000	$12,987,476,000	$18,411,197,000	$71,922,060,000
1997	$42,460,592,000	$12,308,613,000	$18,882,869,000	$73,652,074,000
1998	$44,993,354,000	$11,978,176,000	$19,898,362,000	$76,869,892,000

Chart D4: Calculation of Fisher Ideal Index for Interstate Output

	Revenue Shares			Quantities			Output Indices			Interstate	
	End User	Interstate Switched Access	Special Access	Access Lines	Switched Access Minutes	Special Access Lines	Laspeyres	Passche	Fisher Relative	Output Quantity Index	Growth
Year							A	B	C=(A*B)^0.5		
1984											
1985	10.44%	75.92%	13.65%	92,671,959	156,853,820,000	1,230,590	1.000000	1.000000	1.000000	1.000000	
1986	15.53%	67.82%	16.66%	95,333,884	157,302,701,000	1,664,101	1.053249	1.052253	1.052751	1.052751	5.14%
1987	20.12%	62.58%	17.30%	98,228,585	173,154,171,000	1,764,445	1.083098	1.078813	1.080953	1.137975	7.78%
1988	22.80%	61.13%	16.07%	98,270,787	187,663,836,000	2,701,817	1.144443	1.114960	1.129605	1.285462	12.19%
1989	27.94%	57.75%	14.31%	101,190,050	210,406,134,000	2,448,090	1.065766	1.058920	1.062338	1.365595	6.05%
1990	30.22%	55.51%	14.27%	103,857,988	231,960,296,000	3,518,005	1.129086	1.114500	1.121769	1.531882	11.49%
1991	31.23%	55.07%	13.71%	107,383,807	246,710,182,000	5,151,699	1.111811	1.094856	1.103301	1.690127	9.83%
1992	31.46%	54.86%	13.66%	108,938,065	262,187,655,000	6,033,139	1.062516	1.060258	1.061386	1.793878	5.96%
1993	32.09%	55.07%	12.84%	112,196,681	278,173,161,000	10,153,615	1.136148	1.102619	1.119258	2.007812	11.27%
1994	32.69%	54.35%	12.97%	115,264,861	298,342,017,323	13,824,365	1.095119	1.086800	1.090952	2.190425	8.71%
1995	32.72%	52.93%	14.35%	119,887,506	334,981,582,000	16,107,677	1.101268	1.099925	1.100596	2.410774	9.59%
1996	32.21%	51.11%	16.68%	125,333,996	363,445,050,000	20,775,150	1.101412	1.100708	1.101060	2.654407	9.63%
1997	33.19%	46.41%	20.39%	131,458,355	387,587,696,669	24,479,958	1.079432	1.081360	1.080396	2.867810	7.73%
1998	39.24%	36.56%	24.20%	136,170,133	407,903,661,000	31,620,187	1.095710	1.094610	1.095160	3.140710	9.09%
										Average[1986-95]	8.80%
										Average[1986-97]	8.78%
										Average[1986-98]	8.80%

Chart D5: Calculation of Fisher Ideal Index for Total Company Output

	Revenue Shares			Quantities			Output Indices			Total	
	Local Service	Intrastate Toll and Instratate Access	Interstate	Access Lines	Intrastate DEMs	Interstate Quantity Index	Laspeyres	Paasche	Fisher Relative	Company Output Index	Growth
Year	A	B	C				A	B	C=(A*B)^0.5		
1984											
1985	49.58%	24.00%	26.42%	92,671,959	164,191,177,000	1.000000	1.000000	1.000000	1.000000	1.000000	
1986	49.68%	23.50%	26.83%	95,333,884	173,173,536,000	1.052751	1.041307	1.041125	1.041216	1.041216	4.04%
1987	49.68%	24.14%	26.18%	98,228,585	183,597,411,000	1.137975	1.050944	1.050367	1.050656	1.093959	4.94%
1988	48.69%	24.98%	26.33%	98,270,787	191,904,837,000	1.285462	1.045065	1.043008	1.044036	1.142133	4.31%
1989	49.47%	24.54%	25.99%	101,190,050	207,298,177,000	1.365595	1.050915	1.050139	1.050527	1.199841	4.93%
1990	50.16%	24.53%	25.30%	103,857,988	217,913,904,000	1.531882	1.057256	1.055190	1.056222	1.267299	5.47%
1991	51.67%	23.41%	24.92%	107,383,807	219,713,721,000	1.690127	1.045193	1.044077	1.044635	1.323865	4.37%
1992	52.66%	22.45%	24.89%	108,938,065	224,278,538,000	1.793878	1.027640	1.027198	1.027419	1.360164	2.70%
1993	52.87%	22.16%	24.97%	112,196,681	227,640,869,000	2.007812	1.048699	1.047275	1.047987	1.425434	4.69%
1994	53.20%	21.36%	25.44%	115,264,861	235,362,364,000	2.190425	1.044787	1.044353	1.044570	1.488965	4.36%
1995	55.06%	19.17%	25.76%	119,887,506	246,926,539,000	2.410774	1.057423	1.056813	1.057118	1.574012	5.55%
1996	56.34%	18.06%	25.60%	125,333,996	263,719,641,000	2.654407	1.064092	1.063240	1.063666	1.674223	6.17%
1997	57.65%	16.71%	25.64%	131,458,355	273,526,580,000	2.867810	1.054827	1.054772	1.054800	1.765970	5.34%
1998	58.53%	15.58%	25.89%	136,170,133	286,776,339,000	3.140710	1.059265	1.058149	1.058707	1.869644	5.70%
										Average[1986-95]	4.54%
										Average[1986-97]	4.74%
										Average[1986-98]	4.81%

Chart D6: Labor Input Price and Growth

Year	Total Employees A	Total Compensation B	Labor Rate Annual C = B / A	Labor Price Index (Base = 1985)	Labor Growth %Chg in A
1984					
1985	504,113	16,991,572,326	33705.88	1.000000	
1986	482,698	16,728,435,454	34656.11	1.028192	-4.34%
1987	477,714	16,978,905,847	35541.99	1.054474	-1.04%
1988	466,827	17,030,359,791	36481.09	1.082336	-2.31%
1989	461,149	16,910,850,694	36671.12	1.087974	-1.22%
1990	443,105	17,586,868,921	39690.07	1.177541	-3.99%
1991	414,457	17,186,211,200	41466.81	1.230255	-6.68%
1992	411,167	17,160,988,000	41737.27	1.238279	-0.80%
1993	395,639	17,956,438,000	45385.91	1.346528	-3.85%
1994	367,196	17,154,284,000	46716.97	1.386018	-7.46%
1995	346,843	16,203,522,000	46717.17	1.386024	-5.70%
1996	338,040	16,597,889,075	49100.37	1.456730	-2.57%
1997	338,177	17,451,673,000	51605.14	1.531043	0.04%
1998	338,404	18,128,861,000	53571.65	1.589386	0.07%
				Average[1986-95]	-3.74%
				Average[1986-97]	-3.33%
				Average[1986-98]	-3.07%

Chart D7: Summary of Capital Adjustments and Average Depreciation

Year	TPIS.BOY A	Unadj. Additions B	TPIS.EOY C	Retires D=A+B-C	Adjustment Factor E	Adjusted Additions F = B * E	Adjusted EOY TPIS G = A+F-D	Depreciation Accruals H	Adjusted Depreciation Rate I=H/((A+G)/2)
1984									
1985	138,879,365	15,001,998	149,061,793	4,819,569	0.8880	13,321,774	147,381,569	10,241,376	7.155%
1986	149,061,793	14,842,725	159,010,189	4,894,328	0.8880	13,180,340	157,347,804	11,826,961	7.720%
1987	159,010,189	14,138,370	167,720,577	5,427,983	0.8880	12,554,872	166,137,079	13,311,655	8.188%
1988	168,505,114	14,284,742	175,860,216	6,929,640	1.0000	14,284,742	175,860,216	13,134,992	7.629%
1989	175,860,216	13,283,569	182,978,381	6,165,404	1.0000	13,283,569	182,978,381	13,420,810	7.480%
1990	182,978,381	14,476,334	187,168,695	10,286,020	1.0000	14,476,334	187,168,695	13,439,933	7.262%
1991	187,168,695	14,527,049	192,034,545	9,661,199	1.0000	14,527,049	192,034,545	13,200,593	6.962%
1992	192,034,545	14,611,866	196,411,915	10,234,496	1.0000	14,611,866	196,411,915	13,337,581	6.867%
1993	196,411,915	14,860,116	203,082,418	8,189,613	1.0000	14,860,116	203,082,418	14,032,782	7.025%
1994	203,082,418	14,717,999	209,325,562	8,474,855	1.0000	14,717,999	209,325,562	14,863,196	7.208%
1995	209,325,562	15,374,568	217,430,207	7,269,923	1.0000	15,374,568	217,430,207	15,358,553	7.198%
1996	217,430,207	18,026,150	227,317,120	8,139,237	1.0000	18,026,150	227,317,120	16,252,281	7.309%
1997	227,317,120	18,253,199	236,896,179	8,674,140	1.0000	18,253,199	236,896,179	16,667,034	7.181%
1998	236,896,179	18,553,791	248,970,288	6,479,681	1.0000	18,553,791	248,970,289	17,154,619	7.061%
								Average[1985-95]	7.336%
								Average[1985-97]	7.322%
								Average[1985-98]	7.303%

Chart D8: Construction of Materials Quantity Index

Year	Materials Price Index (1985=1.00) A	Operating Expense B	Depreciation & Amortization Expense C	Employee Compensation D	Materials Expense E = B - C - D	Materials Quantity Index F = E / A	Materials Quantity Index (1985 = 1.0) G	Materials Quantity Index Growth H
1984								
1985	1.000000	40,953,072,435	10,024,710,656	16,991,572,326	13,936,789,453	13,936,789,453	1.000000	
1986	1.031346	42,424,084,849	11,592,001,248	16,728,435,454	14,103,648,147	13,674,987,526	0.981215	-1.90%
1987	1.053529	44,293,127,430	13,316,999,560	16,978,905,847	13,997,222,023	13,286,033,126	0.953307	-2.89%
1988	1.086392	46,809,139,000	13,646,937,000	17,030,359,791	16,131,842,209	14,849,003,149	1.065454	11.12%
1989	1.126234	48,600,813,000	13,860,101,000	16,910,850,694	17,829,861,306	15,831,394,231	1.135943	6.41%
1990	1.172025	49,544,744,000	13,931,515,000	17,586,868,921	18,026,360,079	15,380,530,820	1.103592	-2.89%
1991	1.204935	50,901,049,000	13,499,778,000	17,186,211,200	20,215,059,800	16,776,884,245	1.203784	8.69%
1992	1.234797	50,698,625,000	13,822,882,000	17,160,988,000	19,714,755,000	15,965,992,971	1.145601	-4.95%
1993	1.255352	52,766,635,000	14,244,514,000	17,956,438,000	20,565,683,000	16,382,401,649	1.175479	2.57%
1994	1.291436	55,916,863,000	15,068,058,000	17,154,284,000	23,694,521,000	18,347,418,469	1.316474	11.33%
1995	1.321671	56,831,094,000	15,556,284,000	16,203,522,000	25,071,288,000	18,969,381,288	1.361101	3.33%
1996	1.361400	57,884,494,000	16,377,242,000	16,597,889,075	24,909,362,925	18,296,870,339	1.312847	-3.61%
1997	1.395497	59,731,175,000	16,758,832,000	17,451,673,000	25,520,670,000	18,287,867,671	1.312201	-0.05%
1998	1.430735	60,836,253,000	17,306,863,000	18,128,861,000	25,400,529,000	17,753,487,504	1.273858	-2.97%

Chart D8a: Adjustments of 1985-87 RBOC Operating Expenses for Accounting Changes

	USTA Study Operating Expense A	Nonregulated Expense Adjustmts B	Capital/Expense Shift C	Shift Factor D = (A+B+C)/A	RBOC Operating Expense E	Adjusted Operating Exp. F = D * E
1985	46,223,368,251	406,886,403	1,985,079,714	1.05175	38,938,104,053	40,953,072,435
1986	48,113,849,487	471,112,072	1,959,363,711	1.05052	40,384,079,165	42,424,084,849
1987	49,562,282,080	1,089,570,002	1,908,791,665	1.06050	41,766,392,483	44,293,127,430

Chart D9: Capital Quantity and Price Index Calculations

Year	Benchmark A	Adjusted Capital Additions B	BEA Composite Asset Price C	Capital Stock Quantity D	Capital Input Quantity E	Capital Input Quantity Growth F	Property Income /w Depreciation G	Capital Rental Price** H	Capital Rental Price Index I	Rental Price Index Growth J
1984		n/a		103,903,095						
1985	109,602,959	13,321,774	1.000000	109,602,710	1.000000		23,445,593,794	0.225649	1.000000	
1986		13,180,340	1.010482	114,606,056	1.054855	0.053403	26,792,578,943	0.244452	1.083329	8.00%
1987		12,554,872	1.027339	118,419,511	1.103009	0.044639	27,701,751,800	0.241713	1.071191	-1.13%
1988		14,284,742	1.030466	123,594,868	1.139711	0.032733	26,866,209,000	0.226873	1.005427	-6.34%
1989		13,283,569	1.070178	126,940,642	1.189521	0.042776	25,845,853,000	0.209118	0.926740	-8.15%
1990		14,476,334	1.089729	130,912,833	1.221721	0.026711	25,584,541,000	0.201547	0.893191	-3.69%
1991		14,527,049	1.102220	134,489,094	1.259951	0.030812	24,641,357,000	0.188227	0.834161	-6.84%
1992		14,611,866	1.108304	137,807,183	1.294370	0.026951	26,776,208,416	0.199096	0.882326	5.61%
1993		14,860,116	1.112312	141,057,540	1.326305	0.024372	29,790,583,225	0.216176	0.958020	8.23%
1994		14,717,999	1.117639	143,878,628	1.357687	0.023312	31,539,985,962	0.223597	0.990906	3.38%
1995		15,374,568	1.114809	147,115,146	1.384739	0.019802	34,745,599,902	0.241492	1.070214	7.70%
1996		18,026,150	1.118623	152,437,614	1.415888	0.022246	36,601,808,412	0.248797	1.102586	2.98%
1997		18,253,199	1.117644	157,586,899	1.467113	0.035540	38,074,385,342	0.249770	1.106899	0.39%
1998		18,553,791	1.117690	162,626,701	1.516672	0.033222	39,210,947,194	0.248821	1.102693	-0.38%

Calculation of Property Income Based on External Rate of Return

Year	Earnings Share in Property Income K	Value Line Industrials Return on Total Capital L	(1-K) * G M	(K*G)/(D_{t-1}*1000) N	N_{t-1}+(L-L_{t-1}) O	O*D_{t-1}*1000 P	Property Income M+P Q
1991	33.2%	8.5%	16,460,426,476	0.062491	0.062491	8,180,930,524	24,641,357,000
1992	36.2%	9.6%	16,892,412,130		0.073491	9,883,796,285	26,776,208,416
1993	33.6%	10.9%	17,871,442,472		0.086491	11,919,140,753	29,790,583,225
1994	32.0%	11.9%	17,929,141,800		0.096491	13,610,844,162	31,539,985,962
1995	28.5%	12.9%	19,423,758,640		0.106491	15,321,841,262	34,745,599,902
1996	30.2%	12.7%	21,229,535,984		0.104491	15,372,272,428	36,601,808,412
1997	30.3%	13.2%	21,383,772,507		0.109491	16,690,612,835	38,074,385,342
1998	28.0%	11.9%	24,005,161,440		0.096491	15,205,785,754	39,210,947,194

Chart D10: Factor Shares of Total Payments

Year	Labor Compensation A	Materials Payment B	Property Income /w Depreciation C	Total Factor Payment D = A + B + C	Labor Compensation Share	Materials Payment Share	Property Income /w Depreciation Share
1984							
1985	16,991,572,326	13,936,789,453	23,445,593,794	54,373,955,573	31.25%	25.63%	43.12%
1986	16,728,435,454	14,103,648,147	26,792,578,943	57,624,662,544	29.03%	24.48%	46.49%
1987	16,978,905,847	13,997,222,023	27,701,751,800	58,677,879,670	28.94%	23.85%	47.21%
1988	17,030,359,791	16,131,842,209	26,866,209,000	60,028,411,000	28.37%	26.87%	44.76%
1989	16,910,850,694	17,829,861,306	25,845,853,000	60,586,565,000	27.91%	29.43%	42.66%
1990	17,586,868,921	18,026,360,079	25,584,541,000	61,197,770,000	28.74%	29.46%	41.81%
1991	17,186,211,200	20,215,059,800	24,641,357,000	62,042,628,000	27.70%	32.58%	39.72%
1992	17,160,988,000	19,714,755,000	26,776,208,415	63,651,951,415	26.96%	30.97%	42.07%
1993	17,956,438,000	20,565,683,000	29,790,583,225	68,312,704,225	26.29%	30.11%	43.61%
1994	17,154,284,000	23,694,521,000	31,539,985,962	72,388,790,962	23.70%	32.73%	43.57%
1995	16,203,522,000	25,071,288,000	34,745,599,902	76,020,409,902	21.31%	32.98%	45.71%
1996	16,597,889,075	24,909,362,925	36,601,808,412	78,109,060,412	21.25%	31.89%	46.86%
1997	17,451,673,000	25,520,670,000	38,074,385,342	81,046,728,342	21.53%	31.49%	46.98%
1998	18,128,861,000	25,400,529,000	39,210,947,194	82,740,337,194	21.91%	30.70%	47.39%

Chart D11: Input Quantity Index

	Shares			Quantities			Quantity Indices				
	Labor Compensation	Materials Payment	Property Income /w Depreciation	Labor	Materials	Capital	Laspeyres A	Paasche B	Fisher Relative C=(A*B)^0.5	Fisher Chain	Growth
Year											
1984											
1985	31.25%	25.63%	43.12%	504,113	13,936,789,453	1.00000	1.00000	1.00000	1.00000	1.00000	
1986	29.03%	24.48%	46.49%	482,698	13,674,987,526	1.05486	0.96820	0.96822	1.00611	1.00611	0.61%
1987	28.94%	23.85%	47.21%	477,714	13,286,033,126	1.10301	0.98139	0.98140	1.01099	1.01717	1.09%
1988	28.37%	26.87%	44.76%	466,827	14,849,003,149	1.13971	1.04067	1.04083	1.03731	1.05512	3.66%
1989	27.91%	29.43%	42.66%	461,149	15,831,394,231	1.18952	1.02594	1.02654	1.03384	1.09082	3.33%
1990	28.74%	29.46%	41.81%	443,105	15,380,530,820	1.22172	0.96634	0.96623	0.99151	1.08156	-0.85%
1991	27.70%	32.58%	39.72%	414,457	16,776,884,245	1.25995	1.01403	1.01340	1.02084	1.10410	2.06%
1992	26.96%	30.97%	42.07%	411,167	15,965,992,971	1.29437	0.97023	0.97005	0.99312	1.09650	-0.69%
1993	26.29%	30.11%	43.61%	395,639	16,382,401,649	1.32630	0.99637	0.99530	1.00809	1.10537	0.81%
1994	23.70%	32.73%	43.57%	367,196	18,347,418,469	1.35759	1.03052	1.03050	1.02749	1.13575	2.71%
1995	21.31%	32.98%	45.71%	346,843	18,969,381,288	1.38474	0.99639	0.99689	1.00700	1.14370	0.70%
1996	21.25%	31.89%	46.86%	338,040	18,296,870,339	1.41589	0.96850	0.96855	0.99314	1.13585	-0.69%
1997	21.53%	31.49%	46.98%	338,177	18,287,867,671	1.46711	0.99987	0.99987	1.01674	1.15487	1.66%
1998	21.91%	30.70%	47.39%	338,404	17,753,487,504	1.51667	0.98292	0.98301	1.00662	1.16252	0.66%

Chart D12: Input Price Index

	Shares			Prices			Price Indices				
	Labor Compensation	Materials Payment	Property Income /w Depreciation	Labor	Materials	Capital	Laspeyres A	Paasche B	Fisher Relative C=(A*B)^0.5	Fisher Chain	Growth
Year											
1984											
1985	31.25%	25.63%	43.12%	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	
1986	29.03%	24.48%	46.49%	1.02819	1.03135	1.08333	1.06395	1.06482	1.05335	1.05335	5.20%
1987	28.94%	23.85%	47.21%	1.05447	1.05353	1.07119	1.00008	0.99954	1.00720	1.06094	0.72%
1988	28.37%	26.87%	44.76%	1.08234	1.08639	1.00543	0.96969	0.97133	0.98622	1.04632	-1.39%
1989	27.91%	29.43%	42.66%	1.08797	1.12623	0.92674	0.96486	0.96543	0.97626	1.02148	-2.40%
1990	28.74%	29.46%	41.81%	1.17754	1.17202	0.89319	0.99518	0.99415	1.01874	1.04063	1.86%
1991	27.70%	32.58%	39.72%	1.23025	1.20494	0.83416	0.97284	0.97412	0.99311	1.03346	-0.69%
1992	26.96%	30.97%	42.07%	1.23828	1.23480	0.88233	1.04289	1.04351	1.03304	1.06761	3.25%
1993	26.29%	30.11%	43.61%	1.34653	1.25535	0.95802	1.05647	1.05645	1.06461	1.13659	6.26%
1994	23.70%	32.73%	43.57%	1.38602	1.29144	0.99091	1.03205	1.03192	1.03132	1.17219	3.08%
1995	21.31%	32.98%	45.71%	1.38602	1.32167	1.07021	1.05575	1.05556	1.04287	1.22244	4.20%
1996	21.25%	31.89%	46.86%	1.45673	1.36140	1.10259	1.03017	1.03017	1.03457	1.26470	3.40%
1997	21.53%	31.49%	46.98%	1.53104	1.39550	1.10690	1.01247	1.01229	1.02052	1.29066	2.03%
1998	21.91%	30.70%	47.39%	1.58939	1.43073	1.10269	1.00786	1.00742	1.01418	1.30896	1.41%